



SIEMENS



Answers for Infrastructure

**Performance Based Solutions
for Orem City**

Council Presentation February 9, 2016



Performance Contracting “Value Added”

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- **Utility incentives assigned to sub contractors result in reduced first costs**
- **Reduced pricing negotiations have already been credited to Orem City**
- **Savings guarantee**
- **Project time frame and master schedule – 18 months**
- **Warranty – Extended beyond standard warranty periods**
- **Audit, Counts, Scope Guarantee**
- **No change orders – firm fixed pricing**
- **Annual reports to the City throughout the term of the agreement**
- **Siemens is the General Contractor for the City and manages all vendors, including schedule, material, labor and all documents.**



Progress Milestones

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- **Audit conducted December 8-12, 2014**
- **30% Progress Meeting January 27, 2015**
- **Scope feedback meetings**
- **ROM pricing/savings obtained**
- **60% Progress & MV workshop Meeting April 28th**
- **90% Progress Meeting and final scope decisions June 2nd**
- **Scope finalization, pricing discussions finalized January 2016**



Facility Improvement Measure (FIM) Summary



Siemens Energy Project Proposal

Updated: January 7, 2016

City of Orem, Utah			Implementation Cost	Energy Savings	Simple Payback	Operational Savings	FIM Data	M&V Option
FIM ID	Building	FIM Description	(\$)	(\$)	Years	(\$)		
1.1	CC	Elevator Upgrades	\$ 157,327	\$ -	5.7	\$ 27,817*	FIM Data	E
1.2	FS2	Increased Cooling Capacity	\$ 3,290	\$ (42)	N/A		FIM Data	E
1.3	SC	Boiler Replacement	\$ 61,570	\$ 819	55.0	\$ 300	FIM Data	E
1.4	CL	Solar Shading	\$ 21,935	\$ 1,215	18.1		FIM Data	E
1.5	RC	Boiler Room Air Barrier	\$ 1,301	\$ 202	6.4		FIM Data	E
2.1	All	BAS Upgrade/Expansion, Automation	\$ 222,100	\$ 66,438	3.3		FIM Data	A
3.1	RC	Pool Evaporation Control	\$ 9,462	\$ 18,415	0.9	\$ (7,444)	FIM Data	A
3.3	RC	Pool Circulation Pump VFD	\$ 33,549	\$ 3,778	8.9		FIM Data	E
3.4	RC, SCERA	On-Site Hypochlorite Generator	\$ 262,543	\$ -	11.7	\$ 22,508	FIM Data	E
3.6	RC	Leisure Pool Pump Switch	\$ 813	\$ 603	1.3		FIM Data	E
4.2	CC	Data Center, Hot Aisle Containment	\$ 14,188	\$ 396	8.9	\$ 1,200	FIM Data	E
7.1	RC, SC, CL	C.V. to V.V. Pumping	\$ 41,837	\$ 3,563	11.7		FIM Data	E
8.1	RC, SC	Fan Speed VFD Control	\$ 21,469	\$ 7,287	2.9		FIM Data	A
10.1	All	Bldg Lighting, Controls	\$ 1,085,972	\$ 85,035	9.7	\$ 29,244	FIM Data	A
11.1	Street Lights	Street Lighting Upgrades	\$ 3,195,939	\$ 181,862	10.2	\$ 132,753	FIM Data	A
13.1	All	Bldg Envelope and Mech. Insulation	\$ 240,471	\$ 14,391	16.7		FIM Data	E
14.1	All	Retro-Commissioning	\$ 166,280	\$ 14,849	11.2		FIM Data	E
16.1	RC	De-Stratification Fans	\$ 34,473	\$ 2,555	13.5		FIM Data	E
18.1	CL, SC, RC	Motor Replacements	\$ 19,041	\$ 457	41.7		FIM Data	A
		Construction Management	\$ 856,434					
		Contingency	\$ 119,000					
		Design and Contract Development	\$ 88,001					
		Audit	\$ 42,000					
		Bond	\$ 39,785					
		Total	\$ 6,738,778	\$ 401,824	11.1	\$ 206,378		

*\$27,817 is capital cost avoidance savings, not operational savings



FIM's Evaluated but not Recommended

FIM's Considered but not Recommended	Reason
Infrared heater Controls	Staff does not work with overhead doors open.
Air source heat pump (alt to solar thermal)	Less attractive alternate than solar thermal option.
Boiler Flue Stack Economizers	Space Constraints.
Golf Course & Bldg irrigation measures	City does not pay/meter for irrigation.
Domestic Water Conservation	Water billed on flat rate.
Thin/zero client	In use on authorized machines.
Roof Repairs at City Center (wishlist item)	Repairs are already underway.
Solar PV	Next years rounds of incentives could make it a ph2 possibility.
Water Meters	Being considered as a separate phase.
Exhaust Heat Recovery Re-Cx	System is operating correctly.
PC Power Mgmt	SPB is high.
Fleet Vehicle CNG	Poor SPB, many implementation obstacles to overcome.
WWTP Process Improvements	Very efficient facility, no major opportunities.
Solar Thermal	Poor SPB and potential implemenation challenges.
Irrigation Controls (ET)	Poor SPB due to low rates.
Compressor Replacements, WWTP	Accounted for in budget.



Project Cash Flow



City of Orem, Utah

1/8/2016

Year	Energy Savings	Operational Savings	Elevator Improvement Operational Savings	Gross Savings	Principal & Interest	Ongoing Support	Program Costs	Annual Contribution	Annual Net Cashflow	Cumulative Net Cashflow
18 mo. Constr Period	\$ -			\$ 265,708					\$ 265,708	\$ 265,708
1	\$ 401,824	\$ 178,561	\$ 27,817	\$ 608,202	\$ 531,021	\$ 49,264	\$ 580,285		\$ 27,917	\$ 293,625
2	\$ 415,888	\$ 184,811	\$ 27,817	\$ 628,516	\$ 567,616	\$ 32,982	\$ 600,598		\$ 27,917	\$ 321,543
3	\$ 430,444	\$ 191,279	\$ 27,817	\$ 649,540	\$ 587,651	\$ 33,971	\$ 621,623		\$ 27,917	\$ 349,460
4	\$ 445,509	\$ 197,974	\$ 27,817	\$ 671,301	\$ 608,393	\$ 34,991	\$ 643,383		\$ 27,917	\$ 377,378
5	\$ 461,102	\$ 204,903	\$ 27,817	\$ 693,823	\$ 629,865	\$ 36,040	\$ 665,905		\$ 27,917	\$ 405,295
6	\$ 477,241	\$ 212,074		\$ 689,315	\$ 652,094	\$ 37,122	\$ 689,215		\$ 100	\$ 405,395
7	\$ 493,944	\$ 219,497		\$ 713,441	\$ 675,106	\$ 38,235	\$ 713,341		\$ 100	\$ 405,495
8	\$ 511,232	\$ 227,179		\$ 738,412	\$ 698,930	\$ 39,382	\$ 738,312		\$ 100	\$ 405,595
9	\$ 529,125	\$ 235,131		\$ 764,256	\$ 723,593	\$ 40,564	\$ 764,156		\$ 100	\$ 405,695
10	\$ 547,645	\$ 243,360		\$ 791,005	\$ 749,125	\$ 41,781	\$ 790,905		\$ 100	\$ 405,795
11	\$ 566,813	\$ 243,308		\$ 778,121	\$ 734,987	\$ 43,034	\$ 778,021		\$ 100	\$ 405,895
12	\$ 586,651	\$ 218,704		\$ 805,355	\$ 760,930	\$ 44,325	\$ 805,255		\$ 100	\$ 405,995
13	\$ 607,184	\$ 226,358		\$ 833,543	\$ 132,015	\$ 45,655	\$ 177,670		\$ 655,872	\$ 1,061,867
14	\$ 628,436	\$ 234,281		\$ 862,717	\$ -	\$ 47,025	\$ 47,025		\$ 815,692	\$ 1,877,559
15	\$ 650,432	\$ 242,481		\$ 892,913	\$ -	\$ 48,438	\$ 48,438		\$ 844,475	\$ 2,722,034
	\$ 7,753,472	\$ 3,227,901	\$ 139,087	\$ 11,386,168	\$ 8,051,326	\$ 612,809	\$ 8,664,134	\$ -	\$ 2,722,034	

Program Cost	\$ 6,738,778.00
Rebates	
Bank Fees	\$ -
Amount Financed	\$ 6,738,778.00

Annual Interest Rate	2.300%
Finance Period + 18 mo constr	13
Payments per Year	4
Total Interest Expense	\$ 1,312,547.53

Annual Program Savings	\$ 873,910.40
Simple Payback (years)	7.7

Electricity Escalation	3.5%
Natural Gas Escalation	3.5%
Water Escalation	
Fuel / Other Escalation	
Operational Escalation	3.5%
Service Escalation	3.0%

Finance Period = construction period (1.5 yrs) + repayment period (13 yrs), Interest rate is still indicative until funding is complete. Project will generate in excess of \$50,000 per month in energy and operational savings.



City Staff Project Development



- **Jamie Davidson**
- **Brenn Bybee**
- **Steven Earl**
- **Richard Manning**
- **Brandon Nelson**
- **Bill Bell**
- **Sam Kelly**
- **Taggart Bowen**
- **Charlie Powell**
- **Justin Skillings**
- **Chris Tschirki**
- **Keith Larsen**
- **Justin Gaines**
- **Neal Winterton**
- **Lawrence Burton**
- **Lane Gray**
- **Tyler Peay**
- **Ernesto Lazalde**
- **Tom Phelps**
- **Roger Dunn**
- **Mitch Lewis**

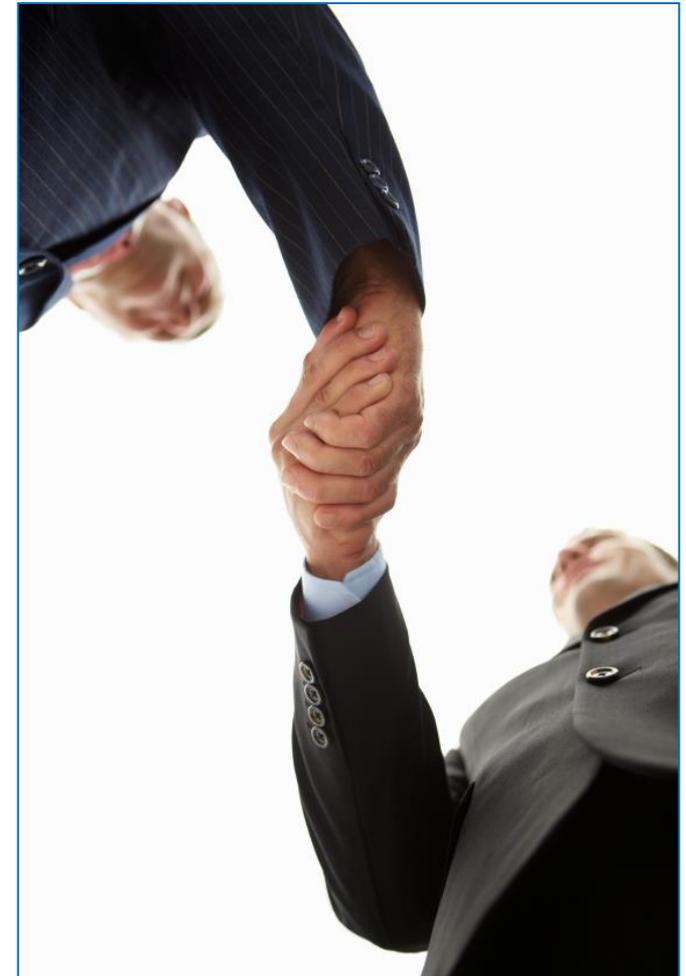


Our Promise – Guaranteed Success

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- **Savings Guaranteed by a multi-billion dollar corporation with a track record of meeting or exceeding its guarantee 99.3% of the time.**
- **Results Achieved**
 - **Infrastructure Improved**
 - **Operating Costs Reduced**
 - **Revenue Enhanced**
 - **Sustainability Goals Achieved**
 - **Workforce Productivity Leveraged**

With a focused, single-source partner in a Budget Neutral Manner!





Approvals

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- **Orem City legal and Siemens legal finalize contract language, based on Council authorized scope of work – January 2016**
- **Council approves contract document language - February 9**
- **Council approves financing – February 9**
- **Approved contract documents are executed – February 12**
- **Finance Closing – February 19**



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“Wishlist” Items

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Proposed FIM :

- Elevator Upgrades
- Increased Cooling Capacity
- Replace Senior Center Boiler
- Window Films
- Boiler Room Air Barrier

Reasons for inclusion:

- City Staff needs (all)
- Ongoing Maintenance expenditures (Boiler)
- Equipment is at or beyond expected life (Boiler & Elev.)
- Occupant comfort issues (Window Films & Cooling Capacity)
- Maintenance and energy savings (Air Barrier, films, boiler)

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BAS Upgrade/Expansion **SIEMENS**

Observation:

- City Center, Library, Public Safety, and Senior Center on Alerton.
- Childrens Library, most of Rec Center, and WWTP (Admin and biosolids) have pneumatic controls or no BAS.
- Public Works on Carrier System

Proposed FIM :

- With BAS the following control strategies are available: Nighttime temp setbacks, outside air damper closure, economizer cooling, DCV, proper boiler/chiller staging, and VV pumping.

Benefits:

- In general, matches equipment operation to building load.
- Longer equipment life due to less run time.
- Better alarming capabilities and less down time.

Pool Evaporation Control

Observation:

- No pool cover in use on either pools or hot tub. Too cumbersome to deploy each night.
- Low humidity setpoint (~45%)

Proposed FIM :

- Use of pool cover reduces evaporation, and boiler load to heat make up water.
- Liquid pool cover is a compound added to pool, (automated).
- Increase RH setpoint up to 60% decreases evaporation.

Benefits:

- Reduced natural gas consumption.
- Longer equipment life due to less run time.





Pool Circulation Pump VFD

Observation:

- Pool circulation pump is single speed and meeting a turnover rate of 6.5 hrs
- State Code dictates minimum turnover for the lap pool is 8.0 hrs

Proposed FIM :

- Install a VFD on the pool circulation pump and slow down the output to meet the 8.0 hrs turnover rate.
- Control VFD output to flow rate, not pressure drop to maintain turnover rate.

Benefits:

- Results in reduced flow rate which reduces electrical power consumption of pump
- Extends equipment life due to decreased loading

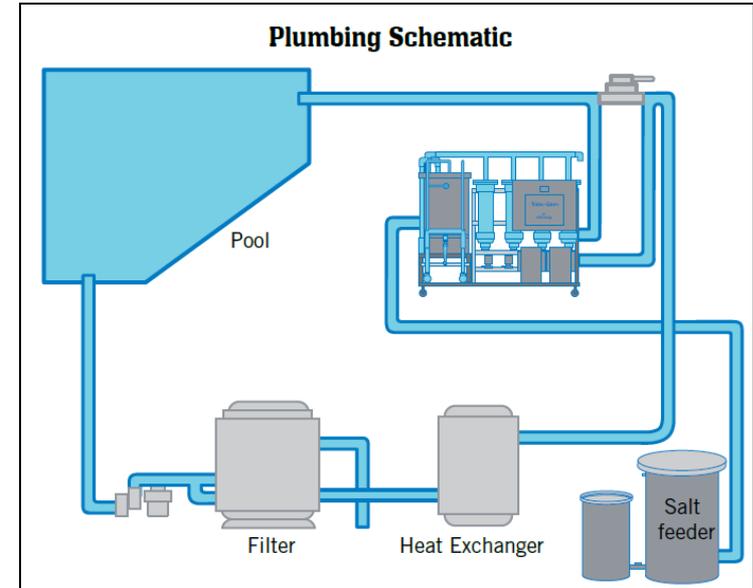
On-Site Hypochlorite Generator (OSHG)

Observation:

- Chlorine tablet system is used to meet sanitation requirements
- Acid used to balance PH levels of pools

Proposed FIM :

- Chlorine can be generated with use of OSHG using only salt which is much cheaper alternative than chlorine tablets



Benefits:

- Reduced operational spend on chemicals including chlorine and acid.
- Reduced staff handling hazard (chlorine).
- Only by-product of OSHG is hydrogen which is vented from building.



Leisure Pool Pump Switch

Observation:

- The lazy river pool feature is used by aerobics class M-F 9a – 10a and again each day from 3p – 10p.
- The pump is controlled in the mech. room by the lifeguards at the VFD and is sometimes left on during the day or overnight wasting energy.

Proposed FIM :

- Program pump VFD to match the usage times.
- Provide an override push button switch on the pool deck for lifeguard use.

Benefits:

- Reduced electrical spend
- Matches equipment operation to usage
- Safer lifeguard operation (avoid entering mech. room)

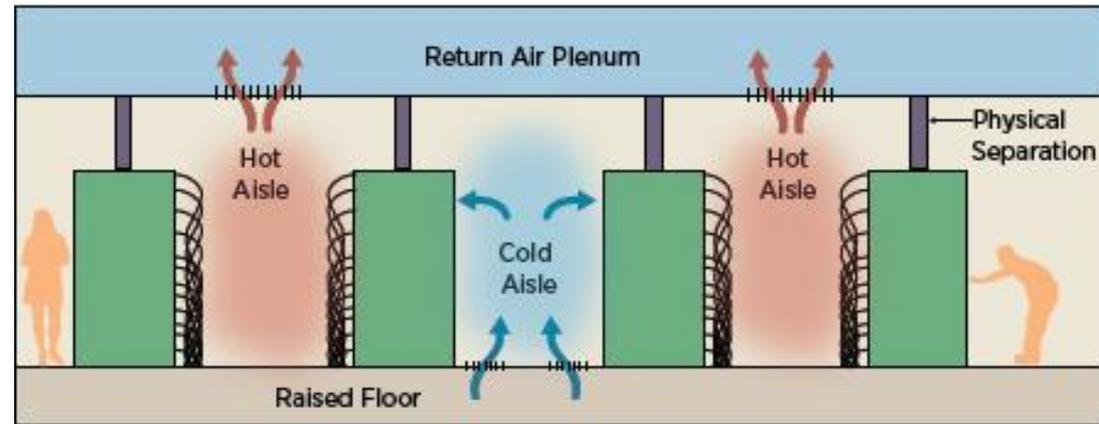
Data Center Optimization: Hot Aisle Containment

Observation:

- CRAC unit is downflow unit with flooded return, mixed airstreams

Proposed FIM :

- Re-configure air system distribution
- Hot aisle containment, move perforated floor tiles
- Blanking panels in open rack server space



Benefits:

- Increase CRAC efficiency
- Operational savings – longer server life due to less hotspots.
- Hot aisle containment considered “Best Practice” among major data center operators such as Google, Intel, Microsoft, etc.



Constant volume (CV) to variable volume (VV) pumping

Observation:

- Chiller and boiler pumps are constant volume with end of loop bypass, 3-way valves at Rec Center and Senior Center.

Proposed FIM :

- Convert 3-Way Hydronic Systems to 2-Way with pump VFD's

Benefits:

- Match flow rates to building loads
- Reduce (pump) energy consumption





Fan Speed VFD Control

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Observation:

- Fans run at full speed on AHU's at Senior Center with IGV's, and the return fan on the pool AHU.

Proposed FIM :

- Neither of these systems need to run at full speed. Add VFD's on these fans to match building loading.

Benefits:

- Reduced electrical consumption.
- Better building setpoint control.
- Increased occupant comfort.



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Building Lighting & Controls

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Observation:

- Retrofit opportunities exist in every building.
- Inventory generally consists of T8/T12 fluorescents, CFL's, halogen, and metal halides.

Proposed FIM :

- More efficient lamps and ballasts
- T8 or LED retrofit
- De-Lamping where possible.

Benefits:

- Reduced electrical consumption.
- Better light rendition
- Longer lamp life and warranty savings
- Saves labor replacing existing lights



[Return](#)



Lighting Controls

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Observation:

- Only the Public Works and parts of the City Center building have lighting controls. Time out complaints from occupants.

Proposed FIM :

- Occupancy sensors, daylight harvesting, and programmable controllers will be implemented to reduce run hours.
- Length of time out can be set by occupants.

Benefits:

- Lighting controls reduce electrical consumption by reducing run times to a minimum.
- Increase lamp life.
- Increase time in-between lamp replacements.

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Street Lighting

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Observation:

- Inventory is high pressure sodium and metal halides. These are high wattage lamps.

Proposed FIM:

- Upgrade to Holophane LED designed specifically for the City of Orem.

Benefits:

- Reduced electric consumption and demand
- Higher efficiency lamps, same light output
- Longer bulb life, warranty savings
- Consolidates lamp inventory
- Saves labor replacing existing lights

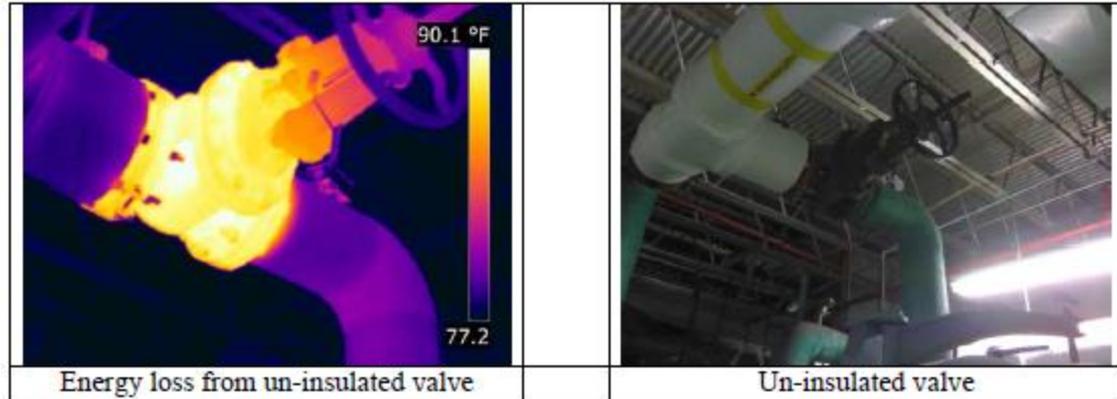


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Bldg Envelope & Mech. Insulation

Observation:

- Construction gaps, leaky windows, doors, allow outside air infiltration.
- Un-insulated pipes and valves waste energy.



Proposed FIM :

- Seal building envelope to reduce sources of major infiltration.
- Insulate pipes, including valves to prevent undesired heat transfer.

Benefits:

- Reduce escape of conditioned air results in less energy usage

Observation:

- HVAC systems are in need of tuning to return to their full operating capacities. Their current state is causing comfort issues and excess energy usage.



Proposed FIM :

- Clean heating and cooling coils, seal loose ducting, ensure VAV box dampers modulate fully close, replace inoperable valves, ensure OA dampers fully close, ensure sensors are still accurate and appropriately placed, replace worn belts, verify proper boiler and chiller sequencing, verify other sequence of operations.

Benefits:

- Returns equipment to its designed standards.
- Works in unison with the controls upgrades/expansion.
- Increases capacity, better occupant comfort, energy savings.



De-Stratification Fans

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Observation:

- Temperature differentials in extremely tall rooms (gyms, pool areas, racquetball courts, children's library and lobby's) is extreme causing excess heating loads.

Proposed FIM :

- De-Strat fans reduce heat load of the building by evening out the temperature differences from floor to ceiling.

Benefits:

- Better occupant comfort due to uniform temperature differential.
- Lower natural gas consumption.

[Return](#)

Observation:

- Many motors through out the facilities are aging and have low efficiencies (70% – 80%).

Proposed FIM :

- Premium efficiency motors are available that are rated up to 92-95%

Benefits:

- Reduce electrical spend while maintaining flow and pressure requirements.
- Replaces aging equipment that is near end of life.

